PROCEEDINGS

OF THE

BIOLOGICAL DEPARTMENT

OF THE

ACADEMY OF NATURAL SCIENCES

OF PHILADELPHIA.

1859.

Reported by Dr. WALTER F. ATLEE, Recorder pro tem.

Dr. JOSEPH LEIDY, Director.

January and February.

I.—ANATOMY.

1. Dr. Hammond exhibited the stomach of a musk rat (*Fiber zibethicus,*) in order to show the peculiar glandular apparatus of the organ in this animal.

Dr. Hammond stated that having occasion recently to dissect one of these animals, he had observed a fact calculated to prove of interest to this Department.

On opening the stomach, a round spongy mass about an inch in diameter was found to occupy the pyloric extremity of this viscus. Upon subjecting it to microscopical examination, it was ascertained to be composed of a mass of tubules similar to those found in other parts of the stomach in the vertebrata generally. The whole secretory apparatus was concentrated in this mass, the remaining portion of the stomach being entirely devoid of any such arrangement, consisting simply of a rugous mucous membrane, the muscular layer, and the serous coat.

A somewhat similar construction exists in the beaver, (*Castor fiber,*) and is described by Cuvier in his *Anatomie Comparée.*

Dr. Hammond had also ascertained that in the genus *Arvicola* (embracing the common water rat,) the same formation and arrangement of the gastric tubules exists.

Dr. Hammond was not aware that attention had hitherto been directed to the structure of this peculiar formation in the animals in question, and hoped to be enabled to extend his researches on the subject.

II.—PHYSIOLOGY.

1. Dr. Mitchell exhibited a microscopical specimen of prismatic blood crystals obtained from the dried blood of the opossum, (*D. Virginiana.*) Dr. Mitchell also exhibited blood crystals obtained from the putrescent blood of the musk-rat, *Fiber zibethicus.* These crystals were rhomboidal tablets measuring a half to two-thirds of a millimetre in length. They formed spontaneously in a phial of blood which had stood in a warm room for five weeks, and was very putrid and of a most unbearable odor.

In connection with the first named specimen, Dr. M. referred at some length to the importance of the study of blood crystals in connection with the medico-legal study of the blood, and the examination of blood stains. Dr. M. remarked upon the difficulty of discriminating between the blood of man and that of some other mammals, even when the blood was comparatively fresh and fluid. Here, he thought, the blood crystal might serve to determine the point in question.

Usually in murder cases, only the dried blood was to be obtained, and here the possibility of making use of the varied forms of blood crystals to determine the source of the blood, was a more doubtful matter. Several questions present themselves.

Can blood crystals be obtained from the dried blood of man and animals? Dr. M. has so far been unsuccessful in obtaining the characteristic form from dried human blood. Some of the German observers have been more fortunate. The failure to obtain the human blood crystal is not, or would not be, decisive as to the inutility of this mode of research, if the blood of other animals does not present a like difficulty. On this point, our information is not altogether complete, because the number of animals whose blood has been examined, is as yet rather limited. The blood of birds, whether in its wet state, or dried, has not afforded crystals under any method as yet employed. This is unfortunate as regards judicial questions, because it is often a question whether a blood stain may not have been derived from pigeon or chicken blood. Dr. M. referred to such a case as within his own experience.

The blood of fishes in general affords crystals with great readiness, even after the blood has been long dried. The forms are characteristic, and are not likely to be confounded with those of human blood.

The blood of all reptiles is difficult to crystallize. Dr. M. would say, after many trials, impossible, were it not for the results which others have observed. At all events no observer has obtained crystals by treating the dried blood of reptiles, nor is it likely that the blood of this class will ever play any part in a judicial investigation. In regard to birds, fishes and reptiles, it is to be observed that the form of the blood globule, and its nuclear condition, may be decisive as to its not being human, and that the production of blood crystals from the blood of these classes is not, therefore, so important as in the case of mammalia, and especially of the domestic animals. In some of these, as the cat, the blood affords good crystals when properly treated, either in a fresh state, or still better when decomposing. Dr. Mitchell was unable to obtain crystals by treating the dried blood of the bullock or sheep, but he obtained crystals easily from the dried blood of the opossum, and from several of the rodentia. It is probable that we shall be able at some future time to obtain crystals from the dried blood of any animal.

Dr. M. especially insisted on the greater ease with which putrescent blood yielded crystals. He thought that exposure to light and the decomposition of the blood, previous to its being dried, were the most favorable conditions. The disappearance of the fibrinous mass under these circumstances, placed the process of crystallization in the best circumstances by setting free the mass of blood globules. Dr. Mitchell was accustomed to obtain crystals from dried blood by moistening the dried clot and occasionally supplying water until putrefaction began, when the blood was treated as though it was fresh.

The blood thus moistened was examined for crystals by the usual method from day to day, but the best results were commonly observed at the period of decomposition.

Dr. Mitchell's remarks gave rise to an animated discussion of the medico-legal examination of blood stains.

Dr. Woodward was of opinion, that it generally is impossible to state the particular mammal from which the blood of a dried blood stain has come, by any mode of microscopic inspection. Dr. Schmidt had constructed tables of

the relative size of the "dried blood globule in man and many animals." Dr. Woodward thought too much stress had been laid upon these measurements, and conceived, that a question which it was very difficult to answer in regard to fresh blood, must become almost unanswerable with dried blood. He had himself been examined in a case where those concerned evidently expected that the microscope would enable him to say of the specimen of dried blood, this is the blood of man, or of this or that mammal. He had found himself unable to decide, and had stated as his fixed opinion, that no examination by the microscope of the blood globules fresh or dried and remoistened would enable any one to swear as to the source of the specimen. He mentioned this, because in this city and elsewhere other opinions are held and taught by many medical men.

Dr. Leidy stated his opinion to be the same as that held by Dr. Woodward. He would feel it to be very unsafe to declare positively to what particular animal certain blood corpuscles belonged. He alluded also to cases where, when judicially examined, he had been obliged to correct erroneous opinions similar to those spoken of by Dr. Woodward.

Dr. Hammond agreed entirely with the opinions held by these gentlemen.

Dr. Hartshorne stated that he had come to the same conclusion as to the impossibility of deciding positively as to the source of blood stains, with or without the use of the microscope.

Dr. Hammond declared that in only one class of cases did he believe that the microscope could be of any service; it would enable the physician to pronounce with confidence that certain stains did not come from the blood of a human being when the corpuscles contained therein were oval or nucleated.

Dr. Atlee stated that he had never observed any white corpuscles in specimens of dried blood. Drs. Leidy and Hammond added the remark, that, as far as their recollection served, they had not observed them.

Dr. Woodward declared that he had seen them very distinctly after six months had elapsed, when blood had been dried rapidly on a slide.

This difference of opinion was attributed by Dr. Morris to not using oblique lights, by which these bodies are much more readily distinguished.

2. Dr. Hammond read a paper entitled "*Observations on the Colorless Blood-corpuscles*," which was referred to a committee.* From a series of experiments Dr. Hammond was led to infer that the white corpuscle is not so persistent in dried blood as the red disc, and therefore not so capable of affording reasonable indications as to the presence of blood as the latter.

III.—Pathology and Pathological Anatomy.

1. Dr. Leidy exhibited specimens of a Trichina found in the muscles of a human subject. He stated that he often meets with this parasite, and, most frequently, in the biceps muscle of the fore-arm.

2. Dr. Mitchell described a gall-stone found in the gall bladder of a musk-rat. It was a soft, amber-colored mass, dissolving readily in hot alcohol. As to the exact nature of this substance he was not determined; it was not, however, either bile, pigment, or cholesterine.

Dr. Uhler, as the result of very considerable study of organic substances, stated he was inclined to believe that many bodies, described as such, are never found in the organism during life, but are the product of chemical manipulations. Moreover, he wished to lay stress upon the point that when vitality

*See American Journal of the Medical Sciences, April, 1859.

leaves any substance, as, for instance, albumen, it loses something it had before, and is no longer the same. In his opinion, bile in the gall bladder is not bile in the chemist's capsule.

3. Dr. Mitchell stated that in a case which had recently occurred to him after, the death of the mother from phthisis, the abdomen was opened three quarters of an hour after her death, and the child, a well developed infant, was found dead and perfectly rigid. He believed the child to have died some time before the mother, from the fact that *rigor mortis* does not occur so soon as the time mentioned in well nourished bodies.

In connection with this subject, Dr. Darrach recalled the ease with which, in some persons, the cutis could be made to rise into weals like those of urticaria.

Considerable discussion ensued as to the interpretation of the phenomena above mentioned, and as to the amount and situation of the non-striated muscular fibre in the skin.

4. Dr. Hammond exhibited the liver of a rabbit (*Lepus domesticus*) containing an immense number of eggs of a parasite. The liver was enormously enlarged, and to the naked eye its whole tissue appeared to be supplanted by granular masses contained in cysts; these bodies when examined by the microscope were seen to be composed of numberless oval cells, containing a distinct nucleus —the yolk. Attached to the liver and hanging in the peritoneal cavity were several masses of hydatids, no tæniæ or other parasites were found in the stomach or intestines. Eggs of the same character as those above referred to were found by Dr. H. in the spleen.

Dr. Hammond also alluded to the constant occurrence of entozoa eggs in the spleen of Chelonian reptiles. In a considerable number of specimens of Emys guttata, Emys terrapin, Emys insculpta, and Emys picta which he had dissected, he had never found these bodies absent from the spleen. Drawings of these eggs, as also of those found in the rabbit, were exhibited.

Dr. Hammond also referred to the common opinion that the lower animals were but little subject to disease. This idea he regarded as erroneous, and thought that the numerous examinations now made of all classes of animals, would soon demonstrate that man is proportionately much less liable to disease than is generally supposed.

5. Dr. Leidy exhibited a specimen of human muscle containing numbers of the peculiar cysts described by him in a former number of the American Journal of the Medical Sciences. These cysts appear not to contain entozoa or their eggs. He had also frequently observed them in the skin. They were irregularly stelliform, and consisted of a fibrous investment enclosing numerous extremely small granules.

Dr. Woodward stated that he had been requested to examine these bodies, and that upon so doing microscopially he was able to confirm Dr. Leidy's opinion of their structure. The minute granules were insoluble in ether, and therefore if consisting of fat were probably enveloped in an albuminous coat.

March.

I.—Anatomy.

1. Dr. Packard called attention to the structure of the swimming bladder of the Gar Pike (*Lepidosteus*) recently caught in the Delaware, and exhibited a portion of the wall. The inner surface of the air bladder of the gar fish recently dissected, presented an arrangement closely resembling that of the heart; viz: papilliform muscles, or *columnæ carnæ*, arising from the wall, and fastened by fine tendinous cords to the edges of tendinous valves, likewise connected with the wall of the bladder.

Between these structures the surface of the wall displayed ridges of mus-

cle running in various directions, the result of their actions being to diminish in all directions the calibre of the organ. The muscles first alluded to had their attached ends towards the caudal extremity of the fish, and ran nearly parallel with the axis of the body: their length, not including the tendons, was about $\frac{1}{2}$ inch, or less.

Under the microscope, fully-formed striated muscular fibre was observed in these structures. The fibres measured about 1-1350th of an inch in diameter, and the ultimate fibrillæ were very coarse. In the heart, the muscular fibres measured about 1-1200th of an inch, but their ultimate fibrillæ were much more delicate.

Dr. Packard was at some loss to recognize the use of this peculiar structural arrangement. Dr. Hammond had examined many fishes, but had never met with striated muscular fibre in this organ. Dr. Mitchell thought that the great rigidity of the scaly covering on this fish might render necessary some additional means of contracting the air sac. He thought the question as to how it was filled a more difficult one. The gar can have no suctorial power, and the air sac is surmounted by a glottis admirably calculated to exclude the air. Dr. Hammond called attention to the degenerated state of the muscular tissues of this specimen. They were more or less converted into fatty matter, and this was especially the case in the muscles of the belly.

Dr. Mitchell described the peculiarities of the circulatory apparatus of the gar pike. In this fish a hepatic vein and a vein from the muscles of the left side open at the same point into the auricle; a third vein from the muscles of the right side opens into the auricle by a separate orifice. The mouths of all these veins are provided with more or less perfect valves, whose edges are attached to the walls of the auricle by tendinous cords and muscular columns. The auricle is very large and easily dilated. The auriculo-ventricular opening has a short fringe-like valve which extends around two thirds of the aperture. The ventricle is small, and very thick. In the specimen examined, no distinct valves could be seen at the orifice through which the ventricle delivers its blood into the bulbus arteriosus, nor were there any valves such as are usually found in the arterial bulb itself. The interior of this organ was furnished with six rows of projecting wart-like prominences, each of which was connected with the one above and the one below, in the same row, by delicate and numerous tendinous filaments whose office it was difficult to comprehend.

II.—Physiology.

1. Dr. Mitchell drew the attention of the Department to a peculiar contraction which is produced when a blow is struck over any of the muscles which are not very firmly bound down by fascia.

Dr. Stokes of Dublin, long ago observed that when he percussed the skin over the pectoralis muscle, its fibres contracted responsive to the stimulus of the blow. While percussing certain consumptive patients, Dr. Mitchell noticed that as the bar of muscle ceased to contract, a second contraction took place nearly at right angles to the first one. By it the skin was raised into a prominence, some lines in breadth and rather longer than the space covered by the percussing finger end. This secondary contraction so slowly disappeared that it seemed to be due rather to the action of organic non-striated muscle, than to the striated variety of which voluntary muscles are composed, and which is habitually rapid in its mode of contraction and of relaxation. Further observation showed Dr. Mitchell that a large part of the muscles, which are neither deeply, placed or firmly bound down by fascia, are able to exhibit both of the forms of contraction here alluded to. Thus the extensor muscles of the leg and arm are not very susceptible to this form of direct stimulus, while the flexors and most of the muscles of the trunk, both before and behind, can be made to exhibit both forms of contraction by tapping them smartly and quickly with the finger

point of a percussion hammer. The primary contraction, or that which involves the whole length of a fasciculus of muscle. is best seen when we strike upon the region of the pectoralis major or that of the gluteus maximus. The secondary and local contraction is best developed by percussing the pectoral region, and the skin which covers the infra spinatus scapular muscle. Illustrations of the phenomena in question are so frequently within reach of the members that Dr. M. did not consider it necessary to describe them more fully.

Several circumstances had already convinced Dr. Mitchell that the secondary contraction, described by him, was not due to the action of the non-striated muscle of the skin. A very obvious and simple experimental test at once referred the phenomenon in question to its proper source,—the voluntary muscles beneath the cuticle.

A small rabbit was rendered insensible by the aid of chloroform, and the skin was removed from the chest so as to expose the surface of the pect. major muscle. Upon striking the muscle with a scalpel handle or any blunt body, two distinct reactions ensued.—1st. The fasciculus of muscle which was stretched by the blow, instantly and rapidly contracted and relaxed. As the relaxation took place, a local contraction occurred at the point struck, so that a small portion of the muscle could be seen to gather itself into a little mound, which again disappeared within from twenty seconds to half a minute. Both phenomena, then, are due to the contractibility of voluntary muscular fibre. Dr. Hammond, who had witnessed the experiment, and who had also seen the phenomenon in question, agreed with the explanation given by Dr. M.

2. Dr. Hammond stated that having had occasion recently to vivisect a bat, (V. novaboracensis) he had observed that the heart continued to beat for some minutes after the chest was laid open. Upon seizing the organ with a pair of forceps a short distance above the orifice of the larger vessels, and severing the connection of the heart by dividing these above the place where they were compressed, pulsation still continued both in the auricles and ventricles for a minute and a half. At the end of that period the heart ceased to act, and could not be re-excited by pricking it with the point of a needle. On opening the forceps so as to allow a little blood to escape, pulsation recommenced and continued for about a minute. It then ceased and could not be excited by irritation. A little more blood was then suffered to escape, and pulsation immediately followed, continuing for several seconds. The same thing was repeated two or three times with a like result, until all the blood had flowed out. The heart then remained perfectly quiescent; its irritability was entirely gone. Dr. Hammond regarded this experiment as tending to disprove the hypothesis that the blood is the excitor of contractility in the heart.

III.—Pathology.

1. Dr. Atlee exhibited a vesicle from an *Hydatid Mole*, mounted in a slide for convenience of examination under the microscope. The specimen came from a patient who was enormously swollen, with albuminuria to a very high degree, and vomitings smelling most offensively of urine. Although but four or five months gone in her pregnancy, the uterus was above the umbilicus. The mass which was spontaneously discharged from the uterus was about as large as the head, and almost entirely similar to the specimen presented. A small part, perhaps as large as two or three fingers, presented the usual color and consistence of the placenta, while all the rest was colorless and of the consistence of ordinary gelatine. All this latter portion was divided into grape-like masses of vesicles full of liquid, varying in size from a pin's head to that of an ordinary marble. There was no vestige of an embryo.

These moles are caused by what might be styled dropsy of the villosities of the chorion. The villosities of the chorion are hollow and composed of a large pedicle, from which a trunk proceeds that is subdivided into many branches. Each one of these ramifications terminates in a cul-de-sac. These moles are

formed by dilatations of the ramifications filled with fluid, taken, of course, by imbibition from the uterine caduca. This condition of things is recognizable not only from the exterior aspect of the mass, but on examining one of these grape-like bodies under a microscope, the same peculiar amorphous substance, with nuclei and granulations interposed, is seen, that characterises the villosities of the chorion.

It is worthy of mention that this is the second time this woman had this same *false conception*, as it is termed.

Dr. Woodward read a paper entitled "*On Suppuration in Cancerous Growths.*" After stating that many of the purulent looking fluids found in connection with cancers were not *pus*, but *softened cancer matter*, this paper proceeded to detail a minute anatomy of a case of ulcerated cancer of the breast, in which a true pus was discharged from the ulcers.

Attention was called to the absence, in this and in many other cases, of the train of peculiar symptoms designated as the cancerous cachexia, and the probability was hinted that these phenomena (as distinct from mere exhaustion by suppuration or hemorrhage,) might, perhaps, bear less relation to cancer *per se*, than to cancerous infiltration of certain internal organs.

In connection with the minute anatomy of the tumor, various doctrinal points were discussed. Especially were the phenomena of suppuration in cancer, as here noted, regarded as confirming the doctrine of the homology of cancer with new formations of connective tissue, and as antagonistic to a *purely* humeral view of the pathology of cancers.

The paper will be published in full in the *American Journal of Medical Sciences.*

April.

I. Pathology.

1. Dr. Morris presented to the Department, a human embryo, accompanied with its membranes. The membranes were developed as much as they generally are at two and a half months. The embryo itself appeared to have been arrested in its development at one and a half months. The chorion and amnion were separated by effused blood, which was also found beneath the coverings of the fœtus and immediately around it.

2. Dr. Leidy called the attention of members of the Department to specimens on the table of three kinds of dipterous larvæ from man. As he had not made the flies an especial subject of investigation, he could not say postively to what genera and species the larvæ belonged.

No. 1, of which there are seven specimens in the vial, appear to be the larvæ of the Blue-bottle fly. They are part of a number which were given him by a physician, and had been vomited from the stomach by a child.

These larvæ are half an inch in length, and 1½ lines at the broadest part; elongated conical, anteriorly acute, posteriorly obtuse; everywhere minutely shagreened; anterior articuli strongly marked; posterior ones with a transverse row of minute papillæ becoming obsolete anteriorly. Head bipapillate, with a pair of hooks projecting from the mouth. Succeeding articulus with a spiracle on each side. Caudal articulus with an elliptical pit margined with a corona of conical tubercles, and having at bottom a pair of large spiracles. Anal aperture bounded on each side with a large trilateral wart, and posteriorly with a transverse crest terminating at each end in a conical tubercle.

No. 2, of which there are five specimens in the vial, appear to be the larvæ of a species of *Anthomyia* or Flower-fly. These are part of numerous specimens, which were given to him for examination, by a physician who had obtained it from his own person. He had been seized with all the symptoms of cholera morbus, and in the discharges he had detected numerous specimens of this, to him, unknown parasite. It was in the latter part of summer; and the larvæ, it is suspected, had been swallowed with some cold boiled vegetables.

The larvæ are from three to three and a half lines long, and from one to one and a quarter lines broad; demi-elliptical; articuli strongly marked, everywhere minutely shagreened; body anteriorly subacute, posteriorly obtuse. Head bipapillate, with a pair of hooks projecting from the mouth. Articuli furnished dorsally and laterally, each with six long, posteriorly divergent, flexible, compound spines; ventral segments transversely subdivided, the posterior subdivision furnished with a transverse row of papillæ. Caudal articulus dorsally sloping, furnished with a pair of prominent spiracular tubercles, and fringed with six spines. Anus ventral.

The same larva Dr. L. had observed in another case, accompanied with the ordinary phenomena of cholera morbus.

No. 3, of which there are nine specimens in the vial, are of especial interest, as being the larvæ of a Bot-fly obtained from man. These specimens were procured by our friend, the accurate naturalist, Dr. Le Conte, during the summer of 1857, in Honduras, Central America. They are part of a larger number of specimens obtained by Dr. L. from his travelling companions. Dr Le Conte had not observed the perfect insect, nor was it known when the latter deposited its eggs. The larvæ were usually found beneath the skin of the shoulders, breast, arms, buttocks, and thighs, and were suspected to have been introduced when the persons were bathing. Thomas Say was the first to describe the larva of a bot-fly from man; the specimen having been taken by Dr. Brick, from his own leg, while in South America.

Recently, Keferstein (Verh. d. Zool. Bot. Vereins, vi, 1856, 637) has prepared an elaborate essay in which he discusses the question as to the existence of a true *Oestrus hominis*. The result of the discussion appears to be that the latter does not exist, but that the oestrus larva obtained from man is that of the *Cuterebra noxialis*, which is especially obnoxious to domestic cattle.

The specimens of larvæ of Dr. Le Conte, however, appear to differ from those generally referred to by Keferstein, but agree with that described by Say, and are not like those described and figured by Goudot, in the An. d. Sc. Nat., 1845, Zool. iii., 221.

According to F. Müller, quoted by Keferstein, the deposit of the egg of the bot-fly in man is very painful. Dr. Le Conte informs us that his companions were not aware of the time when the eggs of the larvæ obtained by him were deposited in their body. He also states the presence of the larva gave rise to comparatively little uneasiness.

These larvæ are from two and a half to five lines long: clavate, incurved; anteriorly ovate, from three-fifths to one and a half lines wide; posteriorly cylindro-conical, from one-fifth to half a line wide. Head bipapillate, with a pair of hooks projecting from the mouth. Succeeding three articuli covered with minute, black, uncinate spines; the next three articuli each provided with large, black, conical, uncinate spines, with a broad striated base and the sharp apex directed backward, arranged in a double row dorsally and forming a single row ventrally. Remainder of the body abruptly narrowed, indistinctly articulated, and smooth, except the last pair of articuli, which are separated by a constriction, and are covered with minute recurved black hooks. The last articulus is oblate spheroidal, enclosing a pair of spiracles and the anal aperture bounded by a pair of papillæ.

Dr. Leidy further called the attention of the Department to a drawing of pus-like corpuscles, which he had obtained from an abscess in the adductor muscle of an oyster. The corpuscles were spherical, granular, and nearly uniform in size. Acetic acid rendered them paler; did not evolve a compound nucleus, but rendered evident one or two isolated oil-like nuclei.

1. Dr. I. I. Hayes read a paper entitled *On the Relations existing between Fova and the capacity of Man to resist low Temperatures.*

This paper was recommended for publication in a Medical Journal. The following is an abstract of the contents:

II. HYGIENE.

Dr. Hayes stated that during the late cruise of the Advance to the Arctic seas, his attention was directed to some facts in relation to the capabilities of men to resist low temperatures, which, at the friendly suggestion of Dr. Hammond, he had grouped together, and, with permission, would submit them to the Department.

He thought that there was a great misapprehension existing in the popular mind upon the subject of Arctic life, it being generally thought that Arctic travellers were necessarily subjected to great hardships, in consequence of the lowness of the atmospheric temperatures. This he could but consider a great mistake. The animal economy everywhere adapts itself with greater or less facility to surrounding circumstances, and this power of adaptation is no where more strikingly exhibited than in the Arctic regions. The appetite and digestive powers are doubtless more intimately concerned than any other of the animal functions, and, in the quantity and quality of the food consumed we are led to look for an explanation of the cause which enables the inhabitants of Polar countries so successfully to resist the cold.

The Esquimaux, with whom he had had communication in the far North, were found living mainly without fire. They have no wood, and no means of creating an artificial temperature, except with a small lamp, using blubber for fuel and moss for wick. The flame of this lamp gives very little heat, and is barely sufficient to melt from the snow the water which they require, and to light their huts during the dark period of the winter. During the coldest season they often live in snow-houses, the temperature of which ranges from zero to the freezing point, being kept thus elevated above the temperature outside, which ranges from —30° to —70°, chiefly by the heat radiated from the persons of the occupants; yet, with this seemingly unendurable temperature they appear to live in comfort. They do not hesitate to expose themselves to any degree of cold, when engaged in hunting, and often sleep upon the snow, with no other protection than a piece of bear skin, on which they lie. Nevertheless, these people are strong, robust and healthy. Scurvy is unknown amongst them, and Dr. Hayes had never heard of, or seen, a case of tubercular disease.

Dr. Hayes thought that we must look for an explanation of this wonderful power of resistance to the character of their food. They subsist entirely upon an animal diet, the flesh mainly of the walrus, seal, narwhal and bear; and the quantity which they consume seems really enormous. He had frequently seen an Esquimaux hunter, when preparing for a long chase, eat from six to twelve pounds, at least one-third of which was fat, and he would place the daily consumption of the men at from twelve to fifteen pounds. In this large consumption of animal food they find their shield against the cold, and he does not believe that they could live upon a vegetable diet under such exposure. The same laws govern the Esquimaux and the white men, and just in proportion as the crew of the Advance accustomed themselves to the diet of the natives, did they gain power to expose themselves with impunity to low temperatures. They found themselves continually craving animal food, and especially fatty substances. The process of acclimation went on in proportion to their ability to eat and digest this kind of diet. During the early part of the cruise, they suffered much from temperatures, which, at a later period, produced no impression whatever upon them.

Dr. Hayes thought it was worthy of more than a mere passing remark, that scurvy and strumous diseases were unknown to the natives of the region, so far, at least, as his observations extended. In relation to the last, he would merely submit the fact: with regard to the former, he would say that whereever scurvy has occurred in the Arctic regions, it has been owing to accidental causes, which experience has taught us to remove or avoid. The long continued use of a salt meat diet had much to do with its development, and, as

accessories, the cold, darkness, and excessive exertions. There is now, however, no necessity for the use of such a diet, and with abundant supplies of fish, animal food, and especially of fat, the last mentioned predisposing causes of disease ceased to have existence. Dr. Hayes thought that it was owing to their weakened condition, resulting from the use of salt food,—of which they could eat only small quantities,—allowing the cold and darkness to prey upon them, that an *epilepto-tetanoidal* disease exhibited itself amongst the men of Dr. Kane's command, and affected similarly their dogs.

While fresh animal food is absolutely essential to the inhabitants of Arctic countries, Dr. Hayes considered alcohol in any shape not only useless but positively injurious; and in this opinion he was fully sustained by the experience of the enterprising and indefatigable traveller, Dr. Rae, whom we had recently the highly gratifying opportunity of welcoming to the Academy. On the other hand, tea and coffee are most useful; and he found himself at a loss to say which is best. The English and Russian's prefer tea, while Dr. Kane's men took most kindly to tea in the evening when retiring, and coffee in the morning when preparing for a day's journey.

In relation to the animal diet used by the Esquimaux, Dr. Hayes observed that they eat it chiefly uncooked and frozen. This fact had been useful to him, and he would suggest it to his brethren of the profession as having, perhaps, some importance. He had frequently found that stomachs of scorbutic patients, which rejected cooked meats, would readily take raw meat in this state, or, as they expressed it, "cooked with frost." By this process the repulsiveness of the uncooked flesh is entirely destroyed.

Dr. Hayes said, in conclusion, that he submitted these facts to the Department without comment, leaving for those better qualified to determine as to whether they threw any new light upon the highly interesting and important physiological questions which they involve.

May.

I.—Pathology.

Dr. Packard read a paper "*On the Pathological Relations of Cancer and Tubercle,**" of which the following is an abstract:

There are several ways of accounting for the property called *malignancy*, so commonly attributed to these formations.

1. A new element may be supposed as formed in or entering the blood, and to be eliminated as if by a gland.

2. The new growth may be considered as the starting point, infecting the system by a sort of radiation.

3. It may be assigned to a mere deterioration of the nutritive material.

4. Some abnormal element may be imagined, determining an erratic development of tissues not themselves essentially abnormal.

The subject is capable of some elucidation from clinical history as well as from morbid anatomy.

I. Under the head of etiology must be considered

(1). *Predisposing causes:* (*a*), Inheritance; (*b*), Age; (*c*), Sex; (*d*), Complexion; (*e*), Residence in the city or country; (*f*), Occupation; (*g*), Depressing influences.

(2). *Exciting causes:* (*a*), Mental or other depression; (*b*), External violence; (*c*), Contagion.

(II). Under the head of symptomatology, all the phenomena occurring in the course of these diseases must be considered.

(*a*), Seat of disease; (*b*), Mode of attack; (*c*), Duration; (*d*), Amount and

* See American Journal of the Medical Sciences, July, 1859.

kind of pain; (*e*), Mental state; (*f*), Hectic fever; (*g*), Formation of humors; (*h*), Modes of termination; (*i*), Convertibility; (*j*), Coëxistence.

The relations of cancer and tubercle to other growths may be readily summed up.

(III). Under the head of morbid anatomy may be mentioned (*a*), The theory of special anatomical elements, characteristic of cancer and tubercle.

(*b*), The theory that those elements are analogous to, or identical with certain normal elements of the body.

This latter theory is, perhaps, the most convenient, but there are some very strong arguments against it, mainly derived from the preceding considerations.

The object of this discussion has been to show that at the present time the material at command is not sufficient for the establishment of any general law, but that we must endeavor to accumulate evidence both from clinical observation and from minute anatomy, until some definite conclusion presents itself.

II.—Physiology.

Drs. Hammond and Mitchell read a paper entitled "*Experimental Researches relating to Corroval and Vao, two new varieties of Woorara, the South American arrow poison.**"

After detailing the history, mode of preparation, physiology and chemistry of the woorara, the authors state their own experiments with the two new varieties of this poison, obtained by Drs. Ruschenberger and Caldwell of the United States Navy, from the Rio Darien, South America, and given to them by Prof. Carson of the University of Pennsylvania.

From these substances they obtained an alkaloid possessing when administered in exceedingly small doses, all the power of the corroval or vao. The corroval yielded a much larger per centage of this principle than the vao, which accounts for the greater activity of the former. This alkaloid is uncrystallizable, but forms salts with many of the acids. When pure it is of a very light green hue, somewhat resembling tannin in appearance. It is intensely bitter.

For this alkaloid they propose the name of *corrovalia.*

Numerous experiments were made with the corroval and vao, from which the authors deduce the following conclusions:

Corroval.—1st. That it differs essentially from any variety of woorara hitherto described, both in its chemical constitution and physiological effects.

2d. That it acts primarily upon the heart, through the medium of the blood, producing an arrest of the action of this organ.

3d. That it produces a cessation of the movements of the lymph hearts in from twenty to thirty minutes after its introduction into the circulation.

4th. That the annihilation of voluntary and reflex movements is a secondary result of its action, depending primarily upon the discontinuance of the functions of the heart.

5th. That it acts upon the nerves from the periphery to the centre, and abolishes both the sensory and motor functions.

6th. That it destroys muscular irritability.

7th. That it paralyzes the sympathetic nerve, this being one of the primary effects.

8th. That it is absorbed both from the intestinal canal and skin of frogs.

9th. That its poisonous qualities are due to an alkaloid hitherto undescribed.

Vao.—1. Vao, either in a solid, or more quickly in a liquid form, can be absorbed from the areolar tissues of cold-blooded animals, as the frog.

2. It is also absorbed, if in solution, by the stomach, œsophageal mucous membrane, rectum, and skin, with a degree of rapidity which varies, and is rapid or slow as the animal is well supplied with water.

3. Warm-blooded animals absorb vao from the stomach and intestine when

*See American Journal of Medical Science, for July, 1859, for this paper in full.

they are fasting, but suffer no ill effects when the vao is given during digestion. That this protection is not due to a mere mixture of the vao with the food of the full stomach, is shown by the fact that rabbits, whose stomachs are always more or less distended with food, are protected only when owing to the entry of fresh food, digestion becomes active.

4. The demands of the system for water do not affect to any perceptible extent the absorption of vao from the stomach of the rabbit.

5. The circulation of the frog is arrested within from ten minutes to one hour by the introduction of vao under the skin. The same result obtains within from twenty-four to forty-eight hours, when the poison is swallowed in small doses.

6. The first effect of vao is to increase the force of the heart without increasing the number of its pulsations.

7. The next effect is a paralysis of the muscular tissues of the heart, so that the ventricle stops first, and the right and left auricles next, in the order in which they are named. In a majority of the frogs poisoned by vao, the heart remains galvanically irritable for a certain time after the organ has ceased to pulsate.

8. The heart stops before the voluntary motions are at an end, in all cases of rapid poisoning. When poisoning occurs by absorption from a mucous surface, the phenomena march more slowly, and voluntary control and reflex power are both lost before the heart has entirely ceased to beat.

9. Vao stops the respiration in warm-blooded animals by arresting the circulation, and so paralyzing the nervous system, without which respiration is impossible, so that the checked respiration is a consequence and not a cause of the injury to the cardiac functions.

10. In the batrachia also, the respiratory movements cease before the heart has entirely lost the power to pulsate.

11. In the alligator poisoned by vao the respiration is perfect some time after the heart is at rest.

12. The facts last quoted and the inability of artificial respiration to restore or sustain the cardiac movements in warm-blooded animals poisoned by vao, prove sufficiently that the first effect of the poison is upon the heart, and that the appearances of asphyxia observed post-mortem in rabbits, cats, etc., are of secondary importance so far as concerns the cause of death.

13. The temperature of warm-blooded animals poisoned by vao falls with considerable rapidity, and does not undergo any elevation after death.

14. The nerves of sensation first lose their power to convey impressions—the motor nerves are next affected. The paralysis of the nerves extends from the periphery to the centre. The affection of the nervous system may be due to the sudden arrest of the circulation, and not of necessity to the direct influence of the vao. The irritability of the voluntary muscles in the frog is lost much earlier than is the case when the animal dies by decapitation.

15. The sympathetic nerve is paralysed, at least in the upper portion of its distribution, before the nerves elsewhere have lost their functional power.

16. The ciliary motion is unaffected by the use of vao.

17. The blood of animals thus poisoned coagulated as usual, and had not lost the power of changing color when exposed to oxygen or carbonic acid.

18. So far as we are aware, no true physiological antidote exists for vao poison, since even artificial respiration fails to sustain life in animals affected by it.

19. The vao poison closely resembles corroval in its physical, chemical, and physiological reactions. The alkaloids extracted from the two poisons produce in animals of equal size effects which cannot be distinguished.

20. We, therefore, are inclined to consider vao as merely a weaker variety of corroval, and to conclude that the apparent difference in the effects produced by the original extracts is due to a difference in their strength.

June.

I.—PHYSIOLOGY.

A paper was read entitled "*An Experimental Examination of the Physiological effects of Sassy-Bark, the ordeal poison of the Western Coast of Africa;* by S. Weir Mitchell, M. D., Lecturer on Physiology in the Philadelphia Medical Association, and William A. Hammond, M. D., assistant Surgeon U. S. A.*

The following is an abstract of this paper:

Sassy-Bark is derived from a tree described by Prof. Procter as Erythrapleum Judiciale, and in the Gardener's Dictionary of Mr. George Dow, as E. Guineense.

The bark occurs in pieces four inches and upwards in length, and half an inch in thickness. It is of a deep red color, a slight odor and a marked astringent, taste due to tannic acid. Both alcohol and water extract its active principles. Mr. Procter failed to obtain from it any crystallizable alkaloid. The preparations used by us were the dry alcoholic extract—the alcoholic tincture.

The effects of sassy, when used as an ordeal poison, have been described by Wilson, Winterbottom, Beecham and Christison, and are fully detailed in the paper of which this is an abstract.

The bark is given in aqueous infusion to the suspected person, who is required to drink large quantities, (several pints). If it produces emesis the person is esteemed innocent; but if he becomes giddy or confused, he is considered guilty and is put to death.

The sassy employed by us was first given to animals, and was finally taken in considerable amount by the authors of this paper.

As is usual in such examinations, frogs were first employed to test the peculiar characters of the poison.

Experiment. A large frog received under the skin of his back one drachm of the tincture, previously warmed to drive off the alcohol. At the close of two hours he had become very sluggish, and indisposed to move. He continued in this condition during twenty-four hours, and then gradually recovered.

Experiment. A frog received a similar dose in the same manner. His heart was then exposed, and attentively watched. It became more feeble as the frog became sluggish, but no alteration in the number of its pulsations was observed. In the course of two or three hours the frog became extremely torpid, but was still able to move when roughly irritated. A second frog, which received 13 of the evaporated tincture in his back, and three grains of the extract in his stomach, became inert like the others, but at the close of forty-eight hours was again active, and on being replaced in water was well two days later.

Still larger doses were tried upon other frogs, with so little result of interest, that we turned at length to warm-blooded animals for more satisfactory and definite conclusions.

Experiment. A large rabbit took internally twelve grains of the dried extract. Within an hour he became languid. At the close of two hours he would remain in any strange position in which he might be carefully and gently placed. He could be laid upon his side, or seated on his gluteal muscles in the corner, without an attempt to escape or resist. If disturbed while in these strange postures, or if placed in them suddenly and roughly, he instantly recovered his activity, and sought to escape, although his efforts were characterized by a certain languor and difficulty which brought him to rest again almost immediately. There was, at this period, no change in the pupils. His sensibility was thought to be diminished, since his skin could be pinched sharply without eliciting any expressions of pain. Six hours later no change was perceptible. He was motionless, unless disturbed, when he moved a few steps and then

* See the Charleston Medical Journal and Review, for November, 1859.

stopped again, and remained with his head couched on his fore paws. He declined food, but drank a little water. Seventeen hours later he was found dead. His urine contained neither sugar, albumen, nor the coloring matter of the sassy. His stomach contained a mass of hay, lettuce, etc., as is usual with rabbits, whose stomachs are never quite empty. The coloring matter of the sassy seemed to have disappeared, and there was not the least evidence of inflammatory action in the stomach or intestines. The heart was large and relaxed, the right cavities containing most blood. The blood vessels of the meninges of the brain were considerably injected, but no other abnormal appearances presented themselves.

Experiment. A small doe rabbit received under the skin of her back eighty drops of the tincture of sassy, previously warmed until it scarcely retained any odor of alcohol, and was thick and turbid. At the same time forty drops were given internally. At the close of half an hour, she was sluggish and unwilling to move, although able to do so when pushed. This torpor gradually increased, the skin became insensitive, the eyes remained half closed, and the limbs appeared feeble, especially the hind legs. When roughly shaken, the torpor passed off for a time, and the rabbit even ate a small quantity of lettuce. In a few minutes, however, the animal again sought the corner, and relapsed anew into the state of stupor above described. If carefully handled, it was then possible to place the animal on her side, or even to suspend her, head downwards, without the least show of resistance or discomfort. During the continuance of these symptoms, the heart beat feebly and the respiration was labored, and sometimes jerking in character. Eighteen hours after receiving the sassy, the rabbit was more active, but not free from a marked languor or difficulty, which appeared in all of her motions. Twenty-five hours after the poisoning, the stupor seemed to have deepened again, and was so profound that the eyes remained nearly closed, and the head, resting on the fore paws, rolled to one side or the other. The rectal temperature was now 102¾° F., or about one to two degrees below the normal standard. So insensible was the rabbit at this time, that she did not appear to feel the passage of the thermometer bulb through the sphincter, although the operation is usually resisted by all animals with great energy. Within ten minutes she slept again, notwithstanding that the thermometer was still in the bowels. Fifty hours from the date of the first dose, the animal was again reviving. At this time she received 1ʒ of the tincture in the stomach, and 1ʒ in the rectum, where it was confined by suitable means. In twenty minutes chewing motions of the jaws were observed, the head fell and was caught up again, and at last reposed on the fore paws, the pupils contracted, the heart became slow and irregular, the respiration quick and labored, and at length, in one hour from the last dose, death occurred with general convulsions and sudden dilatation of the pupils. Upon examination, post mortem, the membranes of the brain were found to be highly congested, but no other appearance of specific value presented itself.

Experiment. A small cat received internally five grains of dried extract of sassy. At the close of two hours she was sluggish, and, half an hour later, vomited with great violence. The matters rejected had none of the color of the extract. Another dose of four grains was vomited up within an hour, and apparently caused great discomfort, due perhaps to the nausea caused by the drug rather than to pain. The disposition towards stupor, which was seen after the first dose, appeared to be relieved by the emesis. The cat survived, and next day was none the worse for the ordeal.

Experiment. A large pigeon received, under the skin of the belly, eighty gtt. of the partially evaporated tincture of sassy. At the same time twenty drops of the tincture were given internally. Within half an hour the pigeon sought a corner, and assumed the usual sleeping posture, the eyes closing and the respiration being rather uneasy and laborious. Now and then it awoke and staggered about, only to sleep again in a few minutes. When thoroughly aroused

by rough shaking, it exhibited more activity. Fifty-five minutes after receiving the sassy, the pigeon vomited very freely. Occasionally, the sleep, into which it always relapsed, became so profound that it staggered and fell down. At the end of two and a half hours the sleep had become comatose, and no agency had power to break it. Meanwhile the sensibility of the surface was impaired, the respiration suffered, the temperature fell to 97½° F. in the cloaca, and death took place, without convulsions, three hours and a half from the time the first dose was given. A second pigeon, similarly treated, except that the doses were smaller, survived twenty-four hours and exhibited no symptoms of importance which have not already been noted, except that at the time of death very slight convulsive movements were seen.

It was apparently plain, from the above detailed observations, that the sassy bark contained a narcotic, or at least a stupefying principle, and it was also probable that it possessed emetic activity. This, however, could scarcely be inferred from the effect upon the cat or the pigeons, because these animals vomit upon very slight provocation. The experiments upon animals had, however, convinced us that we were dealing with an agent that could be safely used in large doses, and which was certainly not a potent poison. Moreover, it was possible that the emetic effect, observed during its liberal use in half pint doses for ordeal purposes, might be due to the bulk of the infusion, which the person suspected was forced to take. Should this have proved correct, and its emetic powders be really feeble when taken in moderation, we should possess a drug in which co-existed narcotic and astringent activity. Such a remedy would have had a certain value, and, considering the poverty of our pharmacopœia in good narcotics, could not have been overlooked. We were also aware that Dr. Thomas Savage, formerly a practising physician on the coast of Africa, had made use of sassy bark in dysentery, but with what effect we were then uninformed.

With these considerations in view, we resolved to test still further the properties of sassy bark, by experimenting upon ourselves. Accordingly one of us took, fasting, three and a half grains of dried extract of sassy. Four hours later he took forty-five drops of the tincture. No effect was perceived, and fourteen hours later he took, fasting, one hundred and twenty drops of the tincture. These repeated doses had no effect, except to interrupt the regular daily action of the bowels. Again, in five hours, another dose of one hundred and twenty drops was taken. Up to this time no symptoms were developed which could be referred with confidence to the effect of the sassy. On a second occasion the same individual took, at one dose, one tablespoonful and a half of the tincture of sassy bark. This large dose was taken two hours after a light meal, at about 9 p. m. Half an hour afterwards, while engaged in writing, he experienced some little giddiness and slight frontal pain, with a sensation of fulness, chiefly at the front of the head. None of these symptoms were of marked intensity. About ten o'clock the tendency to sleep became so apparent that he ceased writing, in which occupation he had been previously engaged, and left the house in the hope that a brisk walk would lessen the effect of the dose. This proved to be the case, but as the narcotic influence faded, a rapidly increasing nausea took its place, and resulted in violent emesis at one a. m., five hours after the tincture was employed. In both instances the pulse fell about fifteen beats below the normal standard.

The effects of the sassy upon another of the authors of this paper is recorded in the following statement:

At 11 a. m. he took four drachms of the saturated tincture of sassy. At the time his pulse was ninety-one per minute. He experienced no unusual sensation till about 12 m., when slight dizziness ensued. At this time his pulse was eighty-three. The narcotic influence was not increased, and at 1 p. m. the pulse beat ninety-three. At this hour he took four additional drachms. At 2 p. m. his pulse had fallen to eighty, and the sedative effect was very sensibly

experienced. Repeated the dose. The pulse continued at from eighty to eighty-four till 5 p. m., when it began to rise. At 7 it was ninety-three. After the third dose the narcotic effect was well marked, but was not greater than would have been produced by a grain of opium. The principal feeling was a pleasant lassitude, a desire for quiet, and an indisposition for either mental or physical exertion.

When the first dose was taken his bowels were slightly loose, and there was some little griping. Both, however, were relieved, and the following morning the bowels were somewhat constipated.

Two days after the foregoing experiments he took, at 10 a. m., one ounce of the tincture. Its effect, marked by a decline in the rapidity and force of the pulse, and the feeling of lassitude above mentioned, was experienced in half an hour. The narcotic was well marked, and was accompanied with headache and slight nausea. The pleasant feelings, experienced with the smaller doses, did not accompany the action of the larger quantity. The pulse remained at from eighty to eighty-five per minute, till about 4 p. m., when the effects began to wear off, although the face was unusually flushed as late as 7 o'clock the same night.

Upon careful consideration of the foregoing experiments, we are disposed to conclude:

1. That sassy bark is a feeble narcotic.
2. That it is nauseant and emetic.
3. That it has a marked astringent effect, and that we have seen nothing justifying the belief in the purgative powers ascribed to it by some writers.

II. PATHOLOGY.

Dr. Mitchell related some curious observations made by him, in the course of experiment, as to *the effect of sugar in rendering the eyes of frogs cataractous.*

When a solution of sugar is injected into the stomach of a frog, or thrown into the subcuticular cellular tissue of the animal, it becomes torpid and dies. In these cases the eye was observed by Dr. M. to present a cataractous appearance. On extracting the lens, the white appearance was found extending into it more or less deeply, as the death had been more or less slow. When the eye was allowed to macerate in water, the appearance of the lens changed and the opacity disappeared.

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*September.**

I.—ANATOMY.

Dr. Schmidt read a communication containing an abstract of the most important points of his researches on the minute anatomy of the human liver. He said:

During the last 18 months, the greater part of my time has been devoted to the investigation of the microscopic anatomy of the liver. The results of that portion of these investigations which had reference to the *minute anatomy of the hepatic lobule*, I published in the last *January* number of the *Amer. Journal of Med. Sciences.* Continuing my researches, I directed them especially to the *general* construction of the *human liver.* Besides having found further evidences of the correctness of my observations in reference to the commencement of the *hepatic ducts*, I have discovered *other* interesting facts relating to the liver. These facts, although complicating our idea of the construction of the liver, nevertheless will explain certain phenomena which have been noticed long ago by various observers.

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* No meetings were held during the months of July and August.

As some time will yet elapse before the completion and publication of my next essay on this subject, I wish to give to-night an abstract of the most important points of my researches. It is as follows:

The *parenchyma* of the *human liver* consists of *two distinct networks* of capillaries, with hepatic cells, free nuclei, and granules. These networks of capillaries are not divided by partitions of fibrous tissue into lobules, but are continuous throughout the whole organ. The meshes which they form are occupied by the cells, nuclei, and granules. One of the networks is formed by the ramuscules of the *portal vein* and *hepatic artery*, and joins the smallest branches of the *hepatic veins*. The other commences independently near the smallest branches of the *hepatic veins*, and is continuous with the finest ramuscules of the *hepatic duct*, and *most probably* also with those of the *lymphatic vessels* of the organ; so that an injection thrown into the *hepatic duct* will return by the latter set of vessels. The capillary vessels forming the last-mentioned network I have described in my former paper on the liver, and called "*biliary tubules*," to distinguish them from the capillaries that carry the blood.

The whole organ is closely surrounded by a capsule of areolar tissue; from this, processes are given off which enclose the vessels, ducts, lymphatics and nerves, and thus become their proper sheaths.

The *portal veins*, *hepatic artery*, and *hepatic duct*, accompanied by *lymphatics* and *nerves*, enter the organ in close proximity at its inferior surface; their larger branches spread out laterally, in a radiating manner, like a fan; some of the vessels, forming the lateral margins of which, run forward, and some backward. The *hepatic veins*, proceeding from the ascending *vena cava*, enter the organ posteriorly, and their larger branches run in a postero-anterior direction; but their secondary branches also radiate, and then run almost parallel with those of the *portal vein* and *hepatic duct*.

The sheath which surrounds the *portal vein*, *hepatic artery*, &c., has usually been known under the name of the "*capsule of Glisson*;" but as the capsule of the *hepatic veins* is strictly analogous to it, I shall, for the sake of simplicity, in referring to it, designate it the "*capsule of the portal vessels*," or "that o the *hepatic veins*." f

Besides the vessels, ducts, lymphatics, and nerves already enumerated, there are in the liver very extensive plexuses, formed by the *ducts of racemose glands*, which I regard as a *special system*. This system of glands has been noticed and described to a certain extent by several observers, yet their relationship to the hepatic ducts and lymphatics has to my knowledge never been thoroughly investigated. They are found on the lower surface of the liver, establishing an extensive communication between the larger ducts. They are very abundant on the capsule of the portal vessels, as far as the point where the true interlobular ducts commence, and also exist in the walls of the gall-bladder. The details of this system of glands I shall give in my next essay. For the present, may it suffice to say that their *ducts*, the diameter of which ranges from 1-700th to 1-4000th of an inch, anastomose freely with each other and form with branches of the *hepatic artery* and *portal vein* (given off within the capsule) a very intricate plexus. From the smallest branches of the latter vessels a capillary *rete* results, which surrounds the lobules of the glands. Judging from the size of the blood-vessels forming the plexus, the supply of blood to these organs must be very abundant.

Another *set of vessels*, or *ducts*, of a diameter from 1-500th to 1-2500th of an inch, with single follicular appendages, proceeds from the *plexus of racemose glands* to communicate freely with the plexus of microscopic *lymphatics*. These vessels I have also found in the *capsule* of the *hepatic veins*. The lobules and larger ducts of the racemose glands are lined by an epithelium of flat hexagonal cells, with large, distinct nuclei, resembling in form and appearance those of the epidermis of the frog.

The *interlobular* and *lobular hepatic ducts* do *not* arise from the glandular plexus, but they can always be traced back to larger ducts.

In front of the *vena cava*, where it passes the substance of the liver, I have found a very dense plexus of the peculiar vessels with follicular appendages already described, and of others without them. A portion of it, about one inch long and half an inch wide, consisted of several layers of these vessels, distinctly enclosed between two layers of the capsule. A network of arteries, similar to that found in other parts of the capsule, was seen in the layers of the latter. The plexus itself I observed both in the injected and fresh specimen, communicating or arising from large vessels, which, by a close examination, proved to be the *lymphatics* of that region, by the *valves* they possessed. Almost around the whole *vena cava* at this place, anastomoses of the above described vessels can be seen.

The description of the microscopic lymphatics of the liver I shall give in my next essay on this subject.

The *interlobular* branches of the *portal vein* and *hepatic artery* are derived from a plexus which is formed by some of their branches in their *capsule.*

Some of the branches of the *hepatic artery* penetrate to the surface of the liver; they are tolerably large and anastomose freely with each other in the *capsule.* From the *anastomoses* thus formed, *smaller branches* proceed, which again in their turn give origin to still *smaller ones.* The latter vessels, when viewed under a low magnifying power, have the appearance of a broken network of large capillaries with large meshes, and as such they have been regarded and described by other anatomists. However, if examined more closely in well injected specimens, we find that they form *no* network of their own, but terminate in the *capillaries of the lobule.*

The *portal vein* also sends small branches to the surface, which, however, do not anastomose with each other. They accompany the larger branches of the *hepatic artery,* (mostly the second set in size, above mentioned,) to terminate likewise in the *capillary network of the lobule.* Thus, there exists *no other communication* between the branches of the *hepatic artery* and those of the *portal vein* on the surface of the liver, except through the *medium of the capillaries of the lobule;* and the blood of the artery, instead of returning to the portal vein, as has been asserted, is with that of the latter discharged into the *capillaries of the lobule,* by which route it arrives directly in the branches of the *hepatic veins.*

The analogy of the blood vessel on the surface of the liver to those in the interior of the organ I shall prove in my next essay.

II.—Therapeutics.

Dr. Leidy read a paper, entitled "*On the seat of the vesicating principle of the Lytta vittata.*"*

From the experiments detailed in this paper, it appears that the vesicating principle of the Lytta vittata belong to the blood, the peculiar fatty substance of certain accessory glands of the generative apparatus, and to the eggs.

III.—Toxicology.

Dr. Morris related several cases of poisoning from the sting of the common bee. In one case, a man died in a very short period of time after the injury was received. In this instance the sting was received in the cervical region In a second case, an adult was seized with convulsions, which lasted for a considerable time. There was during these convulsions complete opisthotonos. He stated that some thirty or more cases, similar to these, have been reported.

* See the American Journal of the Medical Sciences, for January, 1860.

October.

I.—Anatomy.

Dr. Schmidt, with reference to a communication made by him at a meeting held in September, exhibited two livers of sheep, in order to show the method pursued by him, in making his injections. It is as follows:

The liver is placed in a basin from which the air is exhausted. The apparatus is so arranged, that, when desired, a communication can be established with the blood vessels. In making an injection, the pressure is exerted chiefly by the weight of the fluid, which is in a column about six inches in height. So soon as the injection is made in this way into the hepatic duct, the fluid used issues from the lymphatics. The injections are also made in a second manner, the organ not being kept in a vacuum. In this, the lymphatics and their glands are also injected, though the pressure of the air prevents the liquid from flowing from the opened mouths of the lymphatic vessels, as it does when this pressure is removed.

In both the preparations exhibited by Dr. Schmidt, one having been injected in a vacuum, the other not, in the way just described, the lymphatic vessels, and also their glands, were seen injected.

II.—Physiology.

Dr. Morris read the following paper:

Remarks on the Digestive Principle. By J. Cheston Morris, M. D.

In the course of some observations offered to the Department at the session of June 7th, 1858, on the subject of endosmose, I suggested the hypothesis that during digestion a watery fluid was secreted from the gastric mucous membrane, containing a principle which was capable of splitting, or undergoing a fermentative change, so as to produce lactic acid and so-called pepsin. I now have the pleasure of laying before the Department the facts necessary to substantiate that hypothesis.

When a very dilute solution of ov-albumen is exposed to the air at a moderate temperature for several days, it becomes cloudy and has a slightly acid reaction. This change is hastened if air is forced through the solution from time to time. If a small portion of this be added to fresh milk it will cause coagulation of the latter in a short time; boiling the solution previously, diminishes this property. When a thin portion of coagulated albumen is placed in the solution at a warm temperature, it is dissolved in the course of a few hours; if the solution be previously boiled, no such change occurs. When the solution is distilled, the distillate yields a white curdy precipitate with nitrate of silver, soluble in an excess of ammonia.

The above facts correspond so closely, as far as they go, with the properties of the gastric juice that I have no hesitation in stating my belief that they afford the explanation of the mode of formation of the latter. We have, in effect, an albuminous fluid in the stomach, placed under appropriate circumstances as regards oxygen and temperature for the occurrence of fermentative changes; and if by imitating these conditions out of the body we produce analogous results, we have the strongest reasons for believing that the causes and mode of operation are the same in the living body.

The foregoing experiment offers also a satisfactory solution of the apparently discrepant views held by different investigators as to the digestion of azotised food. It becomes no longer difficult to comprehend that the gastric juice, the pancreatic fluid, and the intestinal secretion, as well as decomposing albuminoid matters, may all possess the power of causing a solution of coagulated albumen, &c.; inasmuch as a splitting of an element common to them all, viz. albumen, gives rise to an acid, (probably lactic,) and a digestive principle. I regret that I have not been able to make an ultimate analysis of the substance obtained by evaporating the solution above mentioned to dryness at a low temperature.

These experiments also set at rest the mooted question of the free acid of the

gastric juice; proving that the lactic acid developed during the fermentation of albumen is capable of decomposing during distillation the alkaline chlorides found in the white of the egg.

I should state, however, that I do not regard the above facts as finally conclusive on the subject. More experiments are required to demonstrate the identity of the principle obtained with pepsin.

Dr. Woodward objected to considering the ferment thus produced identical or even closely similar to that of the gastric juice. The gastric juice which this fluid was supposed to resemble did not putrify if kept even for months, whereas the solution produced from albumen, as was stated by Dr. Morris, rapidly putrified. So also the peptones did not undergo putrefaction even in a considerable period of time; the gastric juice acting as an antiseptic, which it appeared from Dr. Morris' statement was not the case with the solution of albumen formed by the new ferment. He suggested the following points for investigation before the similitude should be hastily determined upon.

1. Is the solution of albumen in the new ferment albuminose, and has it its peculiar reactions?
2. Will flesh and similar nitrogenous compounds be dissolved?
3. Will the new ferment interfere with the transformation of starch into grape sugar, as does the gastric juice?

And, lastly. Is the peculiar fungus of the gastric juice developed in it when kept?

II.—PATHOLOGY.

Dr. Mitchell read a paper, entitled "*On the Production of Cataract in Frogs by the injection of large doses of sugar.*"*

November.

I.—PATHOLOGY.

Dr. Woodward exhibited a specimen of foliaceous crystals of the Phosphates formed during the slow alkaline fermentation of urine in a close stoppered phial. These crystals were remarkable for their huge size, some of them being $\frac{3}{4}$ of an inch in length. In chemical behaviour they exactly resembled the smaller sized stellar and foliaceous crystals common to alkaline urine.

Dr. Woodward also exhibited a specimen of highly *acid urine*, in which the acid fermentation had been progressing several days, accompanied by a sediment of uric acid. On the surface was a scum of Penicilium glaucum, which entangled in its meshes numerous crystals of the ammoniaco-magnesian phosphates in fine prisms. This observation, which was the first of the kind he had made, contradicted the general statement made by some, that phosphatic crystals only fall in alkaline urine.

December.

I.—PATHOLOGY.

Dr. Woodward read a paper entitled "*Remarks on errors in the anatomical diagnosis of Cancer.*"†

In accordance with the By-Law of the Department to that effect, the officers of the Department for the ensuing year were elected at the first meeting of the month. They are as follows:

Director—Dr. Leidy.
Vice-Director—Dr. S. W. Mitchell.
Recorder—Dr. Walter F. Atlee.
Treasurer—Mr. Queen.
Conservator—Dr. J. Cheston Morris.
Auditors—Messrs. Slack, Sergeant and Dr. Wurts.

* See American Journal of the Medical Sciences, for January, 1860.
† See American Journal of the Medical Sciences, for April, 1860.

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TO

PROCEEDINGS OF THE BIOLOGICAL DEPARTMENT

FOR 1859.